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Bee-keeping by twentieth century methods ...

J. E. Hand

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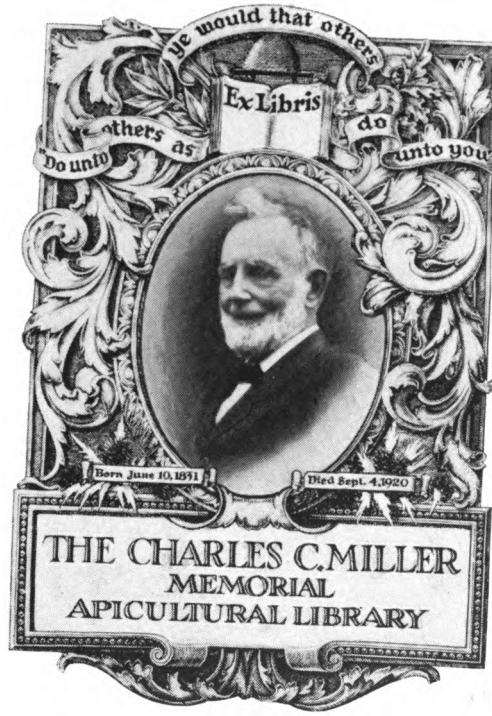

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Bee-keeping

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Twentieth Century Methods

By J. E. HAND
Birmingham, Ohio

PUBLISHED BY
THE A. I. ROOT CO.
MEDINA, OHIO
1911

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PUBLISHERS' PREFACE.

In putting out this work the publishers assume no responsibility for the correctness of the methods herein described; but the author, Mr. Hand, is one of the best-informed bee-keepers in the United States. He has worked out a unique system, which, while not original in the basic principles employed, is original in manner of applying those principles. That the Hand system will revolutionize methods of swarm control, is somewhat a question; but we do believe it is worthy of careful and thorough trial on the part of the unprejudiced. The public will be quick to measure its value, and will unerringly decide whether it is better and cheaper to apply than other systems of management.

That the Hand system has given good results in the apiary of the inventor, can not be denied. The photos show his sky-scraper hives filled with fancy and No. 1 comb honey—hives that have cast no swarms, but have gone on storing honey in the supers uninterruptedly. Whether others will be able to do as well; whether they will find this system cheaper to apply than the ordinary methods of shaking swarms as described in our standard text-books, remains to be seen.

Medina, O., June, 1911.

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INTRODUCTION.

In view of the many excellent works covering the rudimentary principles of apiculture, it would seem that one should offer an apology for introducing another; and were it not for the fact that this work opens up an unexploited field of American apicultural methods and appliances it would not have been written. I assume that the reader possesses a fair knowledge, either theoretical or practical, of the first principles of bee-keeping. As its title implies, this work is a radical departure from the stereotyped style of former works upon subjects pertaining to bee-keeping. It seeks to lift bee-keepers out of the old ruts and place their feet on smooth ground by introducing principles that eliminate all unnecessary manipulation with bees. It reduces the complex methods of honey-production to a very simple science with few manipulations, enabling the bee-keeper to care for twice as many colonies as formerly with a given amount of labor, and at the same time makes it possible for him to enjoy the blessing of perfect control of bees.

From the dollar-and-cent side of bee-keeping, this work will be of inestimable value to the specialist who numbers his colonies by the hundred, and who recognizes the importance of a sure method of controlling bees by short-cut labor-saving methods. It is equally valuable to those who wish to keep bees in connection with some other occupation, and do not have the time to care for them by the laborious methods of the past. It especially appeals to the beginner with a few colonies whose success will, in a great measure, depend upon the methods he adopts at the beginning; for a good start is a long leap toward winning the race.

A careful reading of this book, it is hoped, will enable any one of average intelligence, with a fair knowledge of the rudimentary principles of bee-keeping, to produce paying crops of honey from the start, and have his bees under perfect control all the time. It will tell the industrious farmer how to utilize the nectar that is going to waste upon his fertile soil, and turn it to his own account in securing paying crops of honey without materially interfering with his more arduous

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duties of legitimate farming, and without the loss of swarms that may mean the loss of the honey crop.

Perhaps a word here as to how I came to work out this system may be in order. In 1882 I came into possession of a copy of "Quinby's Bee-Keeping Explained," and it was from this book that he received information that opened his eyes to the wonderful possibilities along the line of controlling bees by shifting them from one hive to another through their unerring instinct to return to the exact spot of their former home. This trait has been of inestimable value to him throughout his bee-keeping experience, for, indeed, it forms the basic principle of his latest invention for controlling bees.

In other words, Moses Quinby, more than half a century ago, laid the foundation upon which, the author believes, must be built every system for the perfect control of bees with a minimum of labor. It is true the information was somewhat meager and the method crude, for Quinby's book was published in 1853, and it required some invention, as well as a thorough knowledge of the habits and instinct of bees, to develop the principle in such a way as to minimize labor in the perfect control of bees.

For a number of years I have practiced the Quinby system of shifting bees from one hive to another by removing a colony and putting a new hive in its place, thus compelling the bees, through their instinct, to hive themselves. Later on the author developed a system of swarm control in the production of comb honey with sectional hives. During the development of this system, however, which was described and illustrated in Gleanings in Bee Culture in 1907, he came into possession of a colony of bees in a Mitchell hive in 1895. This hive being 15 inches wide by 24 long, the colony was limited to about two-thirds of the space by a division-board running crosswise of the hive. The colony being on the verge of swarming I conceived and executed a plan by which the event was forestalled by shifting bees over into the vacant side by means of a pivoted switch lever underneath the division-board. The space into which they were shifted being contracted, forced the bees into the sections at once.

Contraction and expansion being the fad at that time, and having not yet arrived at the ripe experience that would enable me to recognize the wonderful possibilities of such a system when fully developed, it was unwisely laid upon the shelf in favor of the sectional-hive system. I soon discovered, how-

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ever, that, while my present system was a partial success, it involved an almost endless manipulation of hives and brood-chambers, as well as constant watchfulness, rendering the system prohibitive in out-apiaries. No sooner had I arrived at a full realization of the shortcomings of the old system than I began to cast about to discover some new principle that would control bees, and at the same time minimize labor, and my mind naturally reverted to the Quinby suggestion.

The new old idea struck me with wondrous force; for now, by years of experience and observation, I saw at a glance its wonderful possibilities along the line of controlling bees and minimizing labor, having now become fully qualified to develop the new system, which I did in 1909-10. Whatever of value may be found in the principles it introduces is the result of a close study of the habits of bees as well as of a faithful observance of the laws by which they may be so easily controlled, coupled with a careful digest of much that has been written by my predecessors along the line of solving the intricate problems of successful apiculture.

J. E. HAND.

June, 1911.

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HIGHER PRICES FOR HONEY VS. ECONOMICAL METHODS OF PRODUCTION; A COMMON-SENSE VIEW OF THE MATTER.

During the present high prices of food products it has been a source of conjecture among bee-keepers as to why the price of honey has not advanced in proportion to that of other like commodities, and considerable space in the columns of bee-journals has been devoted to the discussion of ways and means to put up the price of honey a cent or two per pound. Vain hopes, fruitless endeavors are these, since honey is a luxury that people can do without; and if the price is high they will do without it. If we raise the price we decrease its consumption, and are brought face to face with its attendant evil—overproduction. Let us begin at the right end of the problem to solve it. It is not higher prices for honey that is needed so much as more modern methods of production—methods that, by their power to economize labor, will cut the cost of production in two. The truth is, bee-keeping as a pursuit has not kept pace with other lines of industry, and we are compelled to acknowledge the humiliating fact that we are still practicing primitive and laborious methods that, during the past quarter-century, have consumed the lion's share of the bee-keeper's time without rendering its equivalent in hard cash. The word "manipulation" that is so often used in connection with bee-keeping methods is but another name for labor. It is safe to assume that three-fourths of the time spent in manipulation by the average bee-keeper could be put to better use by keeping more bees and adopting short-cut labor-saving methods.

The inclination of bee-keeping toward specialization calls for labor-saving methods. The idea that we can materially increase our profits by bestowing a great amount of labor upon a few colonies is an exploded theory, since manipulation in excess of what is necessary in order to keep a colony in a normal condition is a waste of time, and in many respects an actual hindrance to the bees. The experienced apiarist can diagnose correctly the condition of a colony by a glance at the entrance; and merely raising the cover will verify his suspicions without removing a frame.

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SWARMING.

It is not within the province of this work to enter into a lengthy discussion of the complex causes that lead to swarming. Suffice it to say that swarming is the fulfillment of a natural impulse of bees resulting from a condition of numerical strength and general prosperity of a colony. Swarming, although it is nature's plan for the perpetuation of the existence of bees, is nevertheless the greatest obstacle in the pathway of successful comb honey on a large scale in out-apiaries. Natural swarming, with its disappointing results and vexatious losses, can no longer be tolerated by the up-to-date bee-keeper. The day is past when we can afford to watch and wait day after day for the issuing of swarms, not to mention the difficulties of hiving them, often dislodging them from almost inaccessible positions, perhaps in the tallest tree in the yard; and if, perchance, two or three swarms are out at the same time, as frequently happens in a large apiary, there is sure to be a mixup, and the bee-keeper has lost control of his bees. Clipping the wings of the queen, while it prevents the absconding of the swarm, is often productive of disappointing results, since the swarm failing to find its queen in the air becomes panic stricken, and it often requires the utmost skill of the bee-keeper to prevent them drifting into other hives to which they may be attracted by an unusual commotion, as of a recently hived swarm. Nor are these anxieties abated by the use of queen-traps, since their advent introduces complications along new lines; therefore, how to control the swarming impulse of bees with a minimum of labor is the desideratum of modern bee-keeping methods.

It is a fact well known that the conditions that are favorable for successful comb-honey production are likewise productive of swarming; the result is, that, while there is an almost unlimited demand for fancy comb honey at a fancy price, the inclination of bee-keepers to seek the line of least resistance, encouraged by the oft-repeated exhortation to keep more bees and produce extracted honey, has caused a general stampede toward the ranks of extracted-honey producers, thereby glutting the market with that product to the neglect of the better

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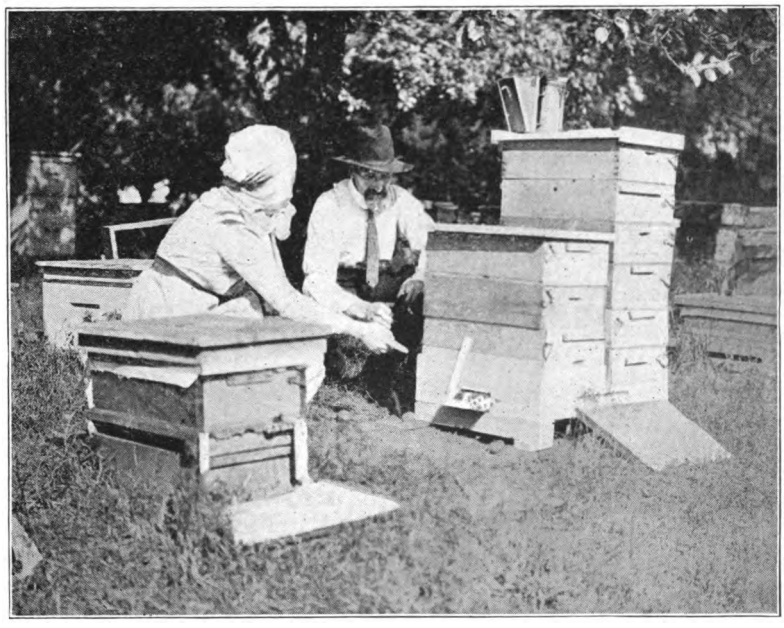
product, comb honey, the future of which never looked brighter than now. The bee-keeper who is wise enough to stay in the ranks of comb-honey producers will find a ready market for his product at his own price and at his own door. Modern methods of controlling bees enable the bee-keeper to produce comb honey cheaper than extracted. Add to this the fact that three consumers will prefer comb honey out of every five, and it should not be a difficult matter to arrive at a correct solution of the market problem.

While in times past the inability of bee-keepers to control the swarming impulse of bees with economy of labor was a



The Hand Double-switch Bottom Explained by the Author.

barrier to the production of comb honey on a large scale in out-apiaries, that barrier no longer exists; and it is now the privilege of all to produce comb honey in out-apiaries with no more trouble from swarming, and with much less expense for equipment, than in the production of extracted honey. From this point of view it is easy to see that the wise bee-keeper will produce both comb and extracted honey. Such a policy will have a tendency to equalize the market between the two

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principal products of the apiary, and relieve the strain of overproduction on extracted that has already begun to loom up.

SWARM CONTROL VS. PERFECT CONTROL OF BEES; A DEFINITION OF TERMS.

In order to have a correct impression concerning a method or system that is being described, it is very important that we have a correct understanding of the terms that are used to designate them. The terms "swarm prevention," "swarm control," and "the perfect control of bees," while having separate and distinct meanings are nevertheless so closely related as to be scarcely distinguishable by the average bee-keeper.

SWARM PREVENTION.

While many have laid claim to successful swarm prevention, such claims have not been sustained. I do not wish to go on record as saying that swarming can not be prevented. The idea that I wish to convey is that, in order to accomplish it, the colony is usually thrown so far from a normal condition as to render it practically unproductive during an ordinary honey-flow. Therefore it is evident that it is neither practical nor profitable, as a rule, to attempt to prevent swarming.

SWARM CONTROL.

Swarm control is different from swarm prevention, in that it does not necessarily prevent swarming, but forestalls the event by substituting the artificial for the natural swarm. Thus by working in harmony with the instinct of bees the swarming impulse is satisfied, swarming is controlled, and our bees are placed in that highly desirable psychological condition without which it is impossible to secure best results in honey-production. The question is no longer, Can swarming be controlled? but, how to control it with the minimum of labor is what the bee-keeper of to-day wants to know, and what it is the purpose of this book to explain.

CRUEL METHODS DISCOURAGING.

Cruel methods, such as decapitating brood, have been employed to discourage swarming, and may prevent it; but such unnatural practices can have no part in solving the problem of the perfect control of bees. If our ambition reaches no higher mark than the mere prevention of swarming, we are not living up to our privileges. We are working in a very narrow channel, and the end does not justify the means.

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THE PERFECT CONTROL OF BEES.

Perfect control of bees in its broadest sense can be attained only by applying correct principles in harmony with the habits and instinct of bees. The perfect control of bees is by no means limited to swarm control; but its principles are so closely entwined around every necessary manipulation with bees as to eliminate unnecessary labor, and render that which is necessary more agreeable as well as less laborious.

FORMER METHODS INEFFECTIVE.

For many years progressive bee-keepers have recognized the importance of a sure method of swarm control; and the brainiest men in the bee-keeping ranks have put forth every effort within their power in an earnest endeavor to solve the swarming problem. Expensive and complicated hives have been invented to hold in check the swarming impulse of bees; but their expense does not end with their first cost. It is multiplied by the amount of labor that is required to operate them. Likewise tubes, traps, and cages without number have had their day of disappointment and doom, and bees continue to swarm as of yore, all because, during these years, inventors have been groping in darkness, unmindful of the fact that bees can be controlled only through their instinct. Thus while others have been blindly and unsuccessfully combatting nature, the real inventor has been assisting her by working in harmony with the God-given instinct of bees. As might reasonably be supposed, his efforts have been crowned with success, having discovered principles by which bees may be controlled with the same precision and certainty that the experienced engineer controls his engine.

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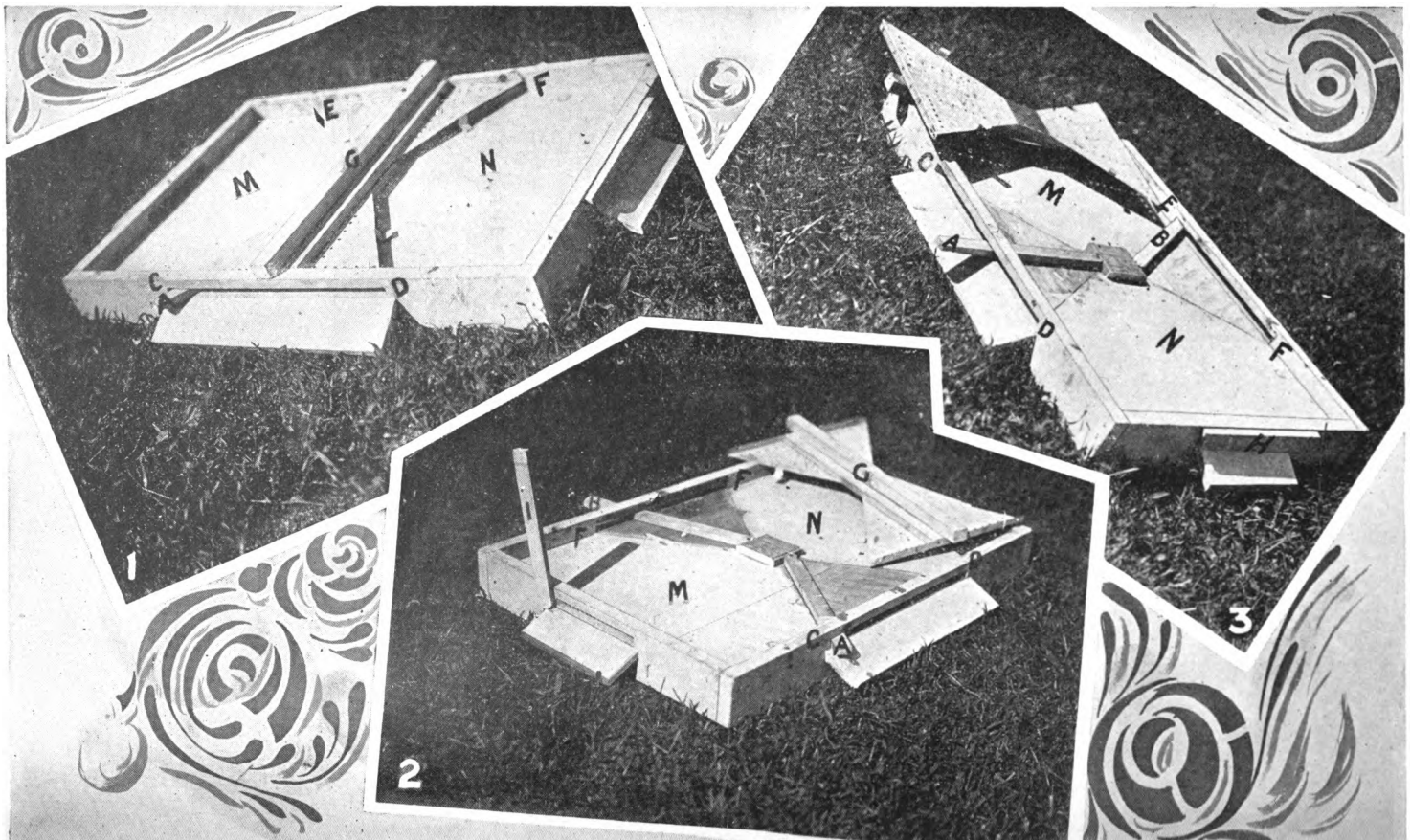

The Hand Double-switch Bottom for Shifting Bees from One Hive to the Other.

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THE EQUIPMENT.

The object of my invention, which consists of a special double bottom-board, is, primarily, for the control of swarms; and, secondarily, for the control of bees along other lines. This is accomplished without any special construction of hives, so that hives of ordinary construction may be manipulated with a minimum of labor. The equipment is inexpensive, and requires but little effort to operate. It involves no conflict nor interference with the habits and instincts of bees, but, rather, takes into account these instincts.

The casting of a swarm by a colony of bees is the result of an overcrowded condition of the brood-chamber, which the bees themselves seek to remedy by swarming. If at the time of the development of conditions that would foster the swarming impulse the bees that would soon make preparations for swarming are transferred to another hive in which there is no brood, and, therefore, in which conditions that would favor swarming do not exist, the swarming instinct is satisfied, and swarming is controlled. In carrying my invention into practice I provide for the shifting of bees from one independent hive to another. It is a fact well known, that, when bees become accustomed to a particular location or hive, as well as to the position of the hive-entrance, they will return with unerring certainty to the exact spot of their former hive-entrance; and any disturbance of the hive in respect to these conditions is productive of excitement and disturbance on the part of the bees on their return to the hive from a nectar-gathering flight.

Taking into account the considerations mentioned, I provide a bottom-board adapted to support, side by side, two hives of ordinary construction. These consist of bottomless bodies, containing the usual brood-combs, as well as the usual extracting-supers or section supers above. The bottom-board, of course, is oblong in form, and at each of its four sides there is an upward extending rim or flange upon which the bottom edge of the lowermost hive-body or brood-chamber is set; and at its transverse center, extending from front to back, is a strip or cleat, against the sides of which the inner sides of the lowermost hive-bodies are positioned. On the central portion of the rim or flange on each long side of the bottom-board there

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is an entrance or opening that extends the same distance on both sides of the transverse center of the bottom-board, and, hence, constitutes what, in effect, is a common entrance into both hives, so that the flying bees coming to either hive will find a familiar location and surroundings, and thus, so far as reaching their entrance is concerned, will be involved in no confusion or difficulty whatever. By means of a switch to be described they may be led or directed without trouble into one hive or the other at the will of the operator, as will be hereafter fully demonstrated.

A suitable alighting-board is shown at each entrance. Each passageway or entrance opens under a V-shaped or triangular plate or partition that extends horizontally inward with its apex toward the center of the bottom-board, and at the same time extends equidistant on opposite sides of the transverse center of the bottom-board. Bees must pass beneath said plate or partition when entering or leaving the hives.

For the purpose of ventilation, holes are provided in the plates. Beneath each plate, and at or near the apex thereof, is pivoted a simple bar or switch that thence extends out through the entrance or passage, where it projects a short distance outside, so that it may be readily grasped by the fingers and swung horizontally from side to side of the entrance. Vertically, said bar or switch is thick enough to close the space between the top surface of the bottom-board and the under side of the plate, so that, when said bar or lever is swung to its limit of motion in one direction, it closes communication between one hive and opens the other. By throwing the lever to the other side it opens the entrance to the other side. The bar, it will thus be seen, forms a gate or switch-lever by which, at the will of the operator, and by the most simple operation, communication between one hive and outdoors may be shut off and communication between the other hive and outdoors opened so that all flying bees, whether belonging to one hive or the other, may be caused to enter one hive or the other. On the opposite side of the double bottom will be found a duplicate switching device, the purpose of which will be explained further on.

At each side of the bottom-board, in the rim or flange thereof, is provided an auxiliary hive-entrance, or opening, with a suitable alighting-board for the opening and closing of which is provided a hinged shutter that may be swung into and out of closing position. The purpose of these auxiliary entrances, each of which, as will be evident, communicates with but one hive, will also be described later.

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THE DUAL-HIVE SYSTEM; OR, THE PERFECT CONTROL OF BEES.

The system of procedure which I pursue for the control of swarming with the minimum of labor, in accordance with my invention, is as follows: Upon the approach of conditions that would result in swarming, one of the switch-levers is moved to one side to close the entrance to the hive on that side, so that flying bees that are outside of the hive, as well as all bees that have become accustomed to using that entrance on returning from the fields, will enter the other hive, on the opposite side of the double bottom. It will be understood that, in connection with the first manipulation of the switch-lever, a hive must needs be provided for the swarm, for this is virtually a system of swarm control by substituting the artificial for the natural swarm, which, however, does not necessarily mean increase unless it is desired, as will be hereinafter fully explained.

Every bee-keeper in the North knows how difficult the task is of getting all colonies in condition to enter the supers at the beginning of clover bloom. It is safe to assume that not to exceed 65 per cent of the colonies in the Northern States are in that condition by June 10—the usual time of clover bloom. The result is that many colonies will yield but little surplus, and some will be barely self-supporting. Equalizing colonies by exchanging combs of brood from strong colonies for empty combs from weak ones is a waste of time, since it is merely robbing Peter to pay Paul. A system that will give us the strongest force of workers right at the beginning of harvest has a great advantage in securing paying crops of surplus honey. Twenty-five strong colonies will store more surplus honey than a hundred weaklings; therefore all colonies that are not in condition to work in supers at the beginning of the honey-flow should be united with some other colony. There is no more excuse for a bee-keeper to allow a part of his apiary to remain unproductive than there is for a farmer to allow a part of his farm to become unproductive by neglecting to attend to the simple details of his occupation. It is true that it requires some skill to control a rousing colony of bees; but it is the rousing colonies that give us rousing crops of

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surplus honey if we possess the skill to direct their energies in the proper channel. To prevent strong colonies from contracting the swarming fever before the main harvest, it is advisable to give them a full-depth upper story of empty combs above a queen-excluder. This will have a tendency to prevent the crowding of the brood-chamber with honey—a condition that may lead to swarming.

The Hand Bottom-board. The Proof of the Pudding is in the Eating.

When the harvest is in full blast, and the top story is found to contain considerable honey, don't wait until it is more than one-fourth full, nor until the bees have made preparation to swarm, but nip the swarming impulse in the bud in the following manner: We will assume that our hives are all on the double-switch-board bottom. The stronger colony with its upper story that is to be manipulated we will call for convenience No. 1, and the hive into which the flying bees are

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to be switched, No. 2. Please remember this in all subsequent references in connection with this double bottom, to avoid confusion.

Begin operations for swarm control by placing the top-story, bees and all, of No. 1 down upon the vacant side of the double-switch-board bottom, and exchange the central comb for a comb of brood and bees, including the queen from hive 1; put on a queen-excluder and a super of sections on No. 2, and close the hives. Next throw the front switch, thus closing the inner entrance to hive 1, and opening the one leading to hive 2, at one operation. This is done without changing the appearance or position of the outside entrance, which is always open full width.

The returning field bees, laden with nectar, will enter the new hive, or No. 2, without a moment's hesitation, and through their accustomed entrance. No time is lost to the bees in getting accustomed to new surroundings, which means a gain of several pounds of honey in favor of this system over other methods where the position of the entrance is changed or where bees are shaken or brushed, and otherwise roughly treated, throwing them into an abnormal condition.

We will now throw the switch on the back side to provide a new entrance to hive 1, which has been so smoothly robbed of its field bees, and which is now given a young laying queen or a virgin just hatched. The honey in the new brood-chamber, or No. 2, will go into the sections to make room for brood below. A strong point in the new system is, that the brood in No. 1 is held in reserve to re-enforce the swarm in No. 2, one hive being a storehouse for honey and the other a nursery for re-enforcements of young bees, both being connected and under perfect control.

As soon as there is a goodly force of young bees again flying from the rear entrance of hive 1 (which will be in eight to ten days) we again shift them over into hive 2 by throwing the switch of the rear or back entrance, again closing the inner entrance to hive 1 and opening that to hive 2. The returning field bees will scamper into hive 2 through their accustomed entrance as though nothing out of the ordinary had happened. Again, this is what we understand by perfect control of bees. Both of the switch-lever entrances to hive 1 being closed, we will provide a new one this time by opening the auxiliary entrance on the side. This will usually settle the swarming question during an ordinary honey-flow. However, in locations hav-

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ing a prolonged honey-flow the method should, perhaps, be modified by using full sheets of foundation in the new brood-chamber; or No. 2, if there is still an inclination on the part of the swarm to cast a swarm they should be shifted back into 1. This is quickly done by reversing both levers, front and rear, and opening the side entrance to 2, to provide for young bees not flying, and for brood hatching out. Next transfer the supers, bees and all, over to 1. Colony 1, having a young queen that has laid but few eggs, will not be likely to cast a swarm, especially since it has a double entrance, front and

The Handy Switch-lever Bottom in Use, Showing Auxiliary Entrance on One Side Open.

rear, and a side entrance, aided by a one-inch space under the frames, making about the strongest combination imaginable for the control of swarming. However, in very hot weather we usually block up one end of the cover half an inch and provide shade-boards for colonies that are exposed to the direct rays of the sun. These are the little things that help to make up the sum total of the perfect control of bees. It is superfluous to add that very few colonies in a normal condition will cast a swarm under the conditions above mentioned.

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INCREASING COLONIES.

In the preceding chapter we outlined methods for the control of bees in a location where the honey-flow comes from clover and basswood or other early-blooming flowers. While the general principles must of necessity be equally effective in every location, the method of applying them must be governed by location, time, and duration of the honey-flow. A little carelessness at this point would render the system less effective; however, the method may be modified to suit existing conditions. For example, in a location having a light honey-flow early in the season, the main harvest coming from buckwheat, heartsease, or other late-blooming flowers, it would be advisable to work for increase early in the season and enter the main harvest with twice or three times as many colonies as we started with in the spring.

In this case we would open the side entrance to hive 1 a week before making the first shift. This will retain a part of the field bees for still another division, since the bees that have the habit of using that entrance will not be shifted by the lever. Proceed as before with the first shift; however, instead of making another shift in the same direction we will, ten days after making the first, remove colony 1 to a new location, putting a new hive in its place, and give them two frames of brood and bees, filling up with empty combs or full sheets of foundation, and give a queen to No. 3 now in the place of No. 1. We have now trebled our number of colonies with little manipulation, and will have plenty of time to build them up to strong colonies in time for the late harvest. In order to build up such colonies rapidly, they must be liberally fed when there is no nectar to be gathered.

In the methods above outlined we run for increase, as well as for honey. While this system will give 100 per cent increase, and more surplus honey than any other system of swarm control that has ever come to our notice, there are times when no increase is desired, in which case no queen is given to colony No. 1, and at the time of making the second shift in the same direction, eight days after the first, insert a specially constructed bee-escape in the entrance of No. 1, back of the switch-lever. This is pushed up tight against it.

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The exit discharges all the flying bees close to the main entrance, which the returning bees will enter, since no bee can enter No. 1. When most of the brood has hatched, and the bees have been added to the swarm automatically, the hives and combs may be used as desired.

SWARM PREVENTION BY REQUEENING.

The statement that "an ounce of prevention is better than a pound of cure" is literally true when applied to swarm control. It is easier to prevent a colony from contracting the swarming fever than it is to break it up after it gets a good start. It is a fact well known, that bees will not, as a rule, begin work in sections until there is no more room in the brood-chamber. Right here is where the swarming fever is usually contracted. If bees can be induced to begin work in the sections right at the beginning of the harvest, before the brood-chamber becomes clogged with honey, there will usually be no more trouble from swarming than in the production of extracted honey. We accomplish this by using full sheets of foundation in sections with an empty extracting-comb (in which no brood has hatched) on each outside. This method, when used in the manner to be described, will give excellent results in honey-production with no swarming. When the harvest has nicely begun, and the hives are boiling over with bees, place two section-supers, prepared as above described, down upon the vacant side of a double switch-board beside a strong colony and throw the switch, shifting the field force over into the supers. Cage the queen and push the cage into the entrance underneath the supers to satisfy the bees and keep them at work. When work has nicely begun in the sections the bees will not desert them. The supers are then placed upon the hive, and the switch reversed, shifting the returning bees over into the hive proper. The first honey will thus go into the sections instead of into an overcrowded brood-chamber, and swarming is reduced to the minimum with little manipulation. When practicing this method, if a ripe queen-cell (or, better still, a young laying queen) is given to the colony after switching the field bees over into the supers,

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the colony will be a non-swarmer for that season. A point that should always be recognized when shifting bees is that the side entrances are safety-valves against the possibility of weakening a colony to such an extent as to cause the loss of unsealed brood or jeopardize the queen; therefore, when practicing this method the side entrance should be opened a week before making the shift. The bees that have become accustomed to using this entrance will not be shifted by the switch, and there will be sufficient bees left to nurse the brood and young queen. In the ordinary shifting of bees for swarm control, however, we do not find this precaution necessary, for the reason that at this season the loss of a little uncapped larvae can not be considered a calamity since they would not come upon the stage of action in time to be of any use as honey-gatherers, and therefore would be consumers instead of producers.

As a rule, young bees do not become field workers until they are ten days old or over; and as it is only the flying bees that are shifted, there will usually be sufficient nurses of a proper age to care for the unsealed larvae if a little thin syrup be given in a feeder, as there will be no flying bees to carry water, which is very necessary to the welfare of young larvae. It will be seen that, while the methods previously outlined control swarming by substituting the artificial for the natural swarm, this method is widely different, in that it entirely prohibits swarming, and with little manipulation.

THE PLURAL-HIVE METHOD.

In all the methods previously outlined we began the season with a single colony on a double-switch-board bottom. While, as a rule, this plan is perhaps preferable where the colonies are all strong, the fact remains that all colonies are not strong at the beginning of harvest. In this case two colonies are united by placing one upon the other, separated by a queen-excluder. This should be done after the bees have quit flying for the day. If a sheet of newspaper is placed between them the bees from the top hive will not fly out for several days; when they do they will not return to their former location. These double deckers having two queens should be provided with a set of extracting-combs above another queen-excluder to prevent the brood-chambers from becoming clogged with honey.

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When the honey-flow is on in good earnest it is time to begin operations for the control of swarming, and we will place the last super of extracting-combs containing bees and honey, but no brood, down on the vacant side of the switch-board, and exchange the central comb for a frame of brood and bees, including the queen from the top hive, or No. 1. Put a queen-excluder on No. 2, the hive with the extracting-comb, and the super of sections, and throw the switch, shifting the field bees from two colonies over into one hive. The honey in the new brood-chamber will go into the sections to make room for brood, the swarming instinct is satisfied, swarming is controlled, and the colony is in condition to do the best work that they are capable of performing under the most favorable conditions. The top hive containing brood but no queen may now be used as an extracting-super above a queen-excluder.

THE HIVE TO ADOPT.

In touching lightly upon this important subject I am not without the knowledge that much that I feel it my duty to say upon the hive question will conflict with the opinion of many who may read it, therefore I will endeavor not to seem too radical. I do not wish to go on record as saying that there is such a thing as a best hive for all men and all locations, nor do I wish to convey the idea that any particular hive will enable the bee-keeper to realize vastly superior results in honey-production, but, rather, to show wherein a medium-sized general-purpose hive is best suited to the needs of the masses.

It is said that a wise man seldom changes his mind, and a fool never. Before passing judgment, however, concerning the wisdom of the author, it is important that those who are familiar with his former views upon the hive question should bear in mind that he is now viewing the subject from a new standpoint as well as under an entirely new light.

Since the Langstroth frame has stood the test of time until it has become the standard for American bee-keepers, it is hardly worth while to consider any other at this late date;

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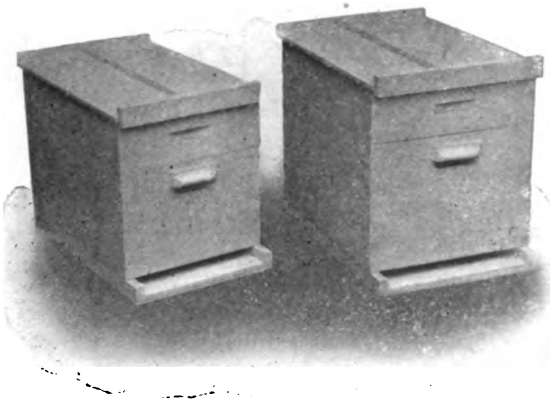
and the only question that remains is, how many frames shall we use in a hive? I am aware that this in a subject upon which there is a wide diversity of opinion. It is generally conceded to be safer to choose a medium course, avoiding the extremes, and it is undoubtedly the part of wisdom for the bee-keeper, and especially the beginner, to follow this rule in the selection of a hive.

The tendency of the times is unmistakably toward larger brood-chambers than formerly. Time was, and not so very long ago, when a goodly number of up-to-date bee-keepers were willing to go on record as saying that the eight-frame hive was large enough for best results in honey-production.



An Eight and Twelve Frame Hive Side by Side, Showing the Relative Difference in Size.

Year by year the number has decreased until to-day there are few who wish to take such a stand; and the former advocates of this hive have either adopted the ten-frame size or else are advocating two eight-frame bodies for a brood-chamber instead of one.

When we acknowledge that the eight-frame hive is too small for best results, we seal its fate; for the extra manipulation necessary for the maintenance of another eight-frame brood-chamber would maintain another ten-frame colony, making the odds greatly in favor of the latter. From an economical point of view, the eight-frame hive is not a desirable proposition. It has been weighed in the balance and found wanting, in that it consumes too much time in extra manipulation. Increased manipulation means increased cost of honey-production and decreased profits to the producer.

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The twelve-frame hive is decidedly an extracted-honey hive, and yet it is doubtful if, under modern methods, it will produce any better results in extracted-honey production than the general-purpose ten-frame hive. Modern methods of controlling bees have proven the fallacy of depending upon large hives for the control of swarming; and so another theory has fallen, carrying with it the last prop that supports the jumbo hive. In summing up the evidence we find that, while the eight-frame and jumbo hives would seem to be best suited to the needs of the specialist, theoretically, yet when put to the practical test side by side with the general-purpose ten-frame hive, the theory goes by default for want of evidence to sustain it, and the latter is increasing in popularity every day. It is of sufficient size to develop the fertility of the average queen, and not so large that a good one can not fill it with bees in time for the clover harvest. It is of sufficient size to accommodate a colony of bees and sufficient stores to carry them through to settled warm weather, rendering the colony largely self-supporting with little attention, all of which are points of excellence that should recommend a hive to the masses.

While a medium-sized general-purpose hive like the ten-frame Langstroth is undoubtedly preferable in some respects to either of the extremes, it is doubtful if the difference is sufficient to warrant any one's discarding good hives on account of their size. Large hives may be used to good advantage in comb-honey production by shifting the flying bees over into a shallow extracting-super at the beginning of harvest, thus forcing them to store practically all the honey in the sections, and switching them back into the large hive to winter. Any of the hives in common use will give excellent results under the new system. Aside from the points of economy and utility mentioned above, one hive is practically as good as another, and all are but an open book when correct principles are applied by correct methods.

SECTIONAL HIVES.

While there are good points in sectional hives, the advantages are not so apparent under the new system, which reduces both hive and frame manipulation to the minimum.

SELF-SPACING VS. LOOSE FRAMES.

From an economical point of view there is no question as to the superiority of self-spacing over loose swinging frames.

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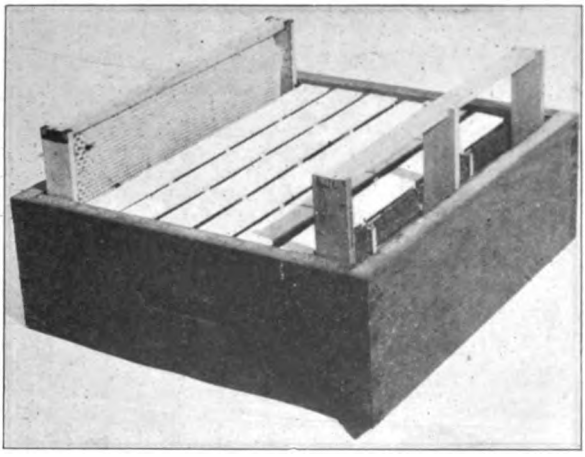
The day is past when bee-keepers can afford to practice the primitive and laborious method of spacing loose frames and then respacing them every time a hive is moved. Self-spacing frames have come to stay, and are another of the little things that help to make things run smoothly. Among the excellent devices for spacing frames there should be little difficulty in selecting a good one.



A Combined Comb and Extracted Honey Super.

SUPERS.

As a matter of economy it is the part of wisdom to adopt a super that is adapted to both comb and extracted-honey production. The advantages of such an arrangement are that, by using an extracting-comb on each side, and section-frames in the center, the sections will be finished quicker, and the surface of the combs maintain that snowy whiteness that adds a peculiar charm to comb honey. These combs also serve as baits in getting the bees started in the supers early, which is a further aid to swarm control. Another advantage in adopting such a super is that the bee-keeper can change from comb to extracted-honey production, and vice versa, at a trifling expense.

FRAMES VS. SECTION-HOLDERS.

Section-holders were introduced as a sort of makeshift to take the place of bottom slats and permit of handling four sections at a time. While such an arrangement is doubtless

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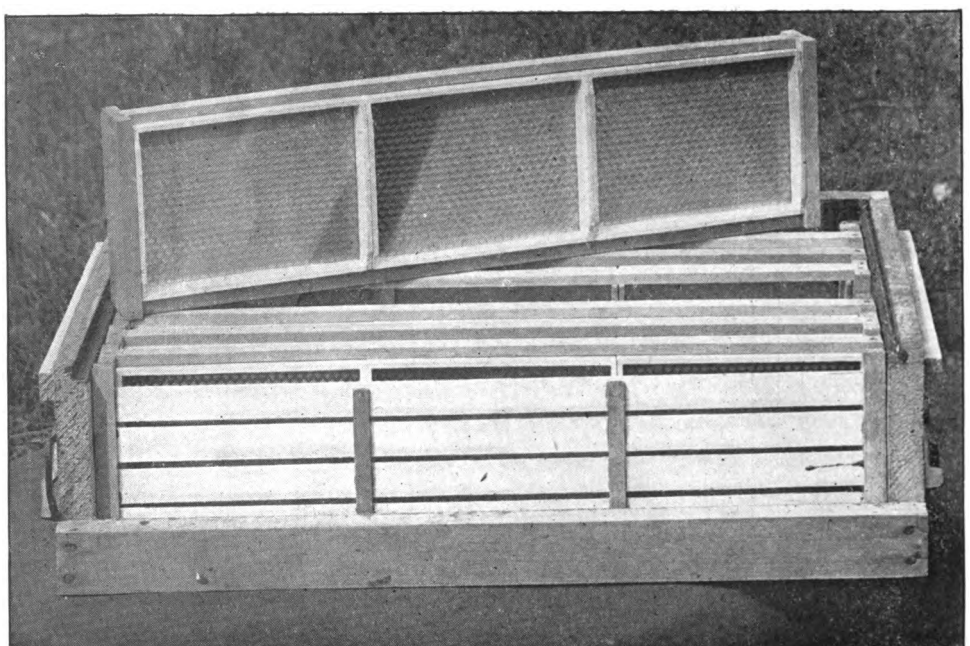

The Hand Comb-honey Super with Split Sections.

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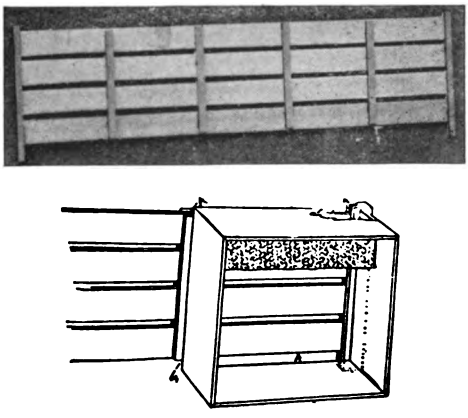
an improvement over the bottom slat, it is weighed in the balance and found wanting, in that it does not protect the tops of sections. In vain do we pay a high price for snow-white basswood sections if we allow the bees to soil them with propolis, only to cause an added expense in extra labor in a vain attempt to restore that virgin whiteness that is lost forever. Frames having a top-bar possess all the advantages afforded by section-holders, with the added advantage of covering the tops of sections, keeping them as white as when they left the sand-papering machine.

SEPARATORS.

While I have produced many tons of section honey without separators, that, by exercising care, could be crated very well, yet as a rule where sections are to be handled by inexperienced persons I doubt the advisability of dispensing with



The Fence and How it is Used with Plain Sections.

separators. Since separators are a necessary evil it is the part of wisdom to choose the lesser evil by using those with as many openings as possible. Slatted fence separators come as near filling the bill as any that have yet appeared, since they insure straight combs, and at the same time afford free communication for the bees in every direction, which is a great improvement over the solid separator that chops the super up into small divisions, and is one of the prime causes that lead to swarming.

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REQUEENING.

This is a practice that is being sadly neglected by the average honey-producer. The maintenance of colonies headed by aged queens is costing the bee-keepers of this country thousands of dollars every year. Poultrymen have discovered that, while a hen will do very good work at laying during the summer season until four or five years old, her capacity for egg-production during the late fall and winter months, when eggs bring the highest price, diminishes rapidly after the first season. The result is, there are few egg-farms of any magnitude in the country to-day where hens are kept for commercial egg-production more than one year. What is true of hens is also true of queens. A young queen will keep up brood-rearing late in the fall, and begin with vigor early in spring, and bring her colony up to the harvest fairly boiling over with bees, while an old one will often be found wanting in these two desirable points. The season of 1910 was a revelation to me along this line. I began the season with 100 colonies containing queens that were reared late the previous season. These colonies were light in bees when put into winter quarters, since they were made up by uniting nuclei late in the season. Notwithstanding these colonies were very light in stores, some of them living virtually from hand to mouth, the hives were packed with brood from side to side long before clover harvest. In the same yard were 100 colonies that had been allowed to do their own requeening, and, of course, were headed by queens of all ages. These colonies were run for honey-production the previous season with practically no swarming, and were strong in bees. While these colonies did excellent work, there was a lack of uniformity of results that was noticeable during the entire season. It is but fair to state, however, in this connection, that the young queens first mentioned were all daughters of the same mother, and this might have had some influence upon uniformity of results. I believe bee-keepers as a rule recognize the importance of requeening at intervals of perhaps two years, but are deterred from doing so for want of an economical method of performing the operation. It is for the benefit of this class that this chapter was written.

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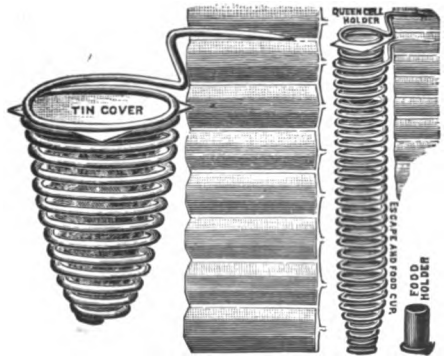
HOW TO REQUEEN AND CONTROL SWARMING AT ONE OPERATION.

For swarm control in extracted-honey production, it is advisable to requeen each season at the beginning of harvest. Assuming that the honey-flow is on, and the supers upon the hives, we will begin operations by placing the top story of colony No. 1 down upon the vacant side of the switch-board and throw the switch, shifting the flying bees over into the super. The next day the hive proper will be robbed of its bees to such an extent that the queen is found with little difficulty. Cage her and push the cage between the combs of the super to satisfy the bees and keep them at work.

As a safeguard against weakening colony No. 1 to such an extent as to jeopardize the young queen, or cause the loss



West's Queen-cell Protector.

of brood, the side entrance should be opened a week before shifting. At the time the queen is removed, either a young laying queen or a ripe queen-cell is given. If the former, no introduction is necessary. Simply cage her for half an hour away from food and other bees, remove the cork, and push the cage between the combs, and close the hive quickly. The queen, being hungry, will proceed to help herself to the sweets, after which she will feel perfectly at home, and no questions will be asked. This is known as the Simmins plan of introduction, and is a very good one.

Since queens and the maintenance of a lot of nuclei cost money, the average honey-producer will find greater economy in practicing the ripe-cell plan, especially since queen-cells can be produced in any quantity at little expense. The day before

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the cell is due to hatch (which will be the tenth day after grafting, if you have chosen larvae of the proper age), place it in a West cell-protector, and push the spur into a comb containing brood, letting the point come well down over the brood. Three days later examine the cell. If the capping has been cut off smoothly as by a sharp pair of scissors, the queen is all right, and the supers may be replaced upon the hive and the switch reversed. A subsequent examination will determine whether or not the young queen has passed the mating period in safety. Thus we have killed two birds with one stone—namely, requeened and controlled swarming, all at trifling expense, and with little manipulation.

THE CONTROL OF SWARMING WHEN RUNNING FOR EXTRACTED HONEY BY THE SWITCH LEVER.

To control swarming in the production of extracted honey, where no increase is desired, set a hive containing frames with full sheets on the empty side of the double switch bottom. When the harvest has nicely begun, and hive No. 1, made up of two or more stories, is boiling over with bees, throw the front switch lever, shifting the field force over into the new hive, or No. 2. At the time of making this shift, arrange the rear shift lever so that the rear entrance of No. 1 is open and No. 2 closed. Exchange the central frame for a frame of brood, including the queen, from colony No. 1. On No. 2, which now contains the working force, place a super of empty combs above a queen-excluder. In eight days place the brood-chamber of colony No. 1 on top of colony 2, and throw the back or rear switch lever, shifting the returning bees that have been going into No. 1 into No. 2. . . . There will be no swarming and no increase, and the result will be a rousing crop of surplus honey with very little manipulation. As fast as the brood hatches in the top story the combs will be filled with honey.

By this method, practically every comb in the apiary is utilized for the storing of honey to be extracted, for which full sheets of foundation are substituted in all the brood-chambers, with little frame-handling.

INTRODUCING QUEENS.

The odor theory prevails to a considerable extent among bee-keepers. I say theory, because, notwithstanding this sub-

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ject has been harped upon for the last quarter-century, it has not yet passed the theoretical stage. In the absence of proof to sustain it, this groundless theory should have gone by default long ago. The theory is that, by caging a queen in a strange hive for two or three days, she acquires the colony odor, after which she will be accepted by the bees of that colony. The fallacy of this theory is proven nearly every day by bee-keepers, and especially queen-breeders. It is a fact well known that the attitude or behavior of a queen is largely responsible for the loss of queens in introduction. If a queen can be placed in such a condition that she will walk right down among the bees without fear or favor she will seldom be molested. Virgin queens at mating age are acknowledged by all to be the most difficult to introduce, and yet we have instances without number where young queens returning from their mating-trip have entered a queenright colony and superseded the reigning queen.

The Simmins system, previously mentioned, is based upon the theory that if food is denied the queen for half an hour she will be so eager to satisfy her hunger that she loses sight of all else and helps herself to the first honey she comes to, after which she will feel perfectly at home, and will seldom be molested. As some have not been successful in introducing by this method, however, the following modification of this method is a little safer.

THE HAND-SIMMINS PLAN.

It is a fact well known that young bees will accept a queen more readily than old ones, therefore it is very desirable to have an economical method of disposing of the cranky old maids until the frisky young damsel is safely installed in her new home. To accomplish this we place the super down upon the switch-board beside the colony to be requeened, and throw the switch, shifting the flying bees over into the super; cage the old queen and push the cage in at the entrance under the supers after caging the young queen away from food for half an hour. Now let her run down between the combs of the old colony, and all is well. As soon as she gets to laying nicely, place the supers back upon the hive and reverse the switch. By this method the colony is not queenless at any time, and requeening by this method does not interfere with honey-gathering.

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A method that is, perhaps, used oftener than any other is to remove the old queen, and at the same time place the young one in a Miller cage with the opening plugged with queen candy. By the time the candy is eaten out the queen will have become accustomed to her surroundings, and will be perfectly at home, and will usually be accepted by the bees. A method that will always work is to shake about a pound of bees from the top story of a hive above the queen-excluder, into a box provided with a wire-screen cover, and keep it in a cool place for twelve hours, after which they will accept any kind of queen. To introduce the queen, thump the box upon the ground, jarring the bees to the bottom, and drop the queen into the box among the bees, after which they are lightly sprinkled with sweetened water and hived the same as a natural swarm; but no unsealed brood should be given for several days.

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AMERICAN FOUL BROOD.

Foul brood is a highly contagious bacterial disease which attacks the brood of bees but does not materially affect adult bees; therefore the honey as well as the diseased larvae and infected combs are the chief channels through which the contagion is conveyed. The utmost care should be exercised to keep all honey and combs from infected colonies where robber bees can not get even a taste of it. Combs that have contained foul-brood germs should be rendered into wax, or burned at once, as soon as the brood has hatched after treatment. Since this dread disease is liable to break out in any apiary at any time, it behooves every bee-keeper to be able to detect it in its incipient stages before it gets a strong footing in his apiary.

During the ordinary manipulations with combs the apiarist should keep an eye upon the brood, if some of the cappings have a sunken and irregular appearance; and if the caps are perforated with ragged holes it is an indication of dead brood; and further investigation will reveal the true cause of the difficulty. All dead brood is not foul brood. There is pickled brood, chilled brood, and starved brood; but none of these will develop into foul brood.

Foul brood is distinguished by its extreme ropiness and coffee-brown color; also, if present in sufficient quantities, a strong odor of a disagreeable nature is noticeable. It may be detected by lifting up a portion of the decayed larva upon the point of a toothpick; if the decayed mass adheres to the point of the stick and stretches out in a ropy manner perhaps an inch, and if capped brood contains ragged holes in sunken caps, it is, in all probability, genuine foul brood. However, this disease is little to be feared under modern methods of controlling bees.

EUROPEAN FOUL BROOD OR BLACK BROOD.

Black brood is another form of brood disease similar to American foul brood. While this disease attacks both the sealed and unsealed brood, black brood more particularly attacks the unsealed brood, although in its advanced stages

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capped brood often dies and the caps have a sunken and perforated appearance.

Early infection may be detected by the presence of a yellowish spot within the curve of the larva as it lies in the cell. This yellow spot enlarges, the larva dies, and, settling to the lower side, gradually assumes a darker appearance, ending with the characteristic dark-brown or black scale of black brood. While these two forms of brood disease are devastating entire apiaries, and costing bee-keepers thousands of dollars every year, the bee-keeper who practices up-to-date methods has little cause for apprehension along this line.

TREATMENT OF BOTH AMERICAN AND EUROPEAN FOUL BROOD.

It is a mistake to brush or shake bees from foul-broody combs, since bees when disturbed fill their sacs with infected honey, thus carrying the infection into the clean hive, often necessitating another brushing. The time to treat foul brood is at the beginning of the honey-flow from which we expect to get our surplus-honey crop.

To treat foul brood successfully and economically, first remove the queens from the diseased colonies, and, unless the colonies are very strong, make them so by uniting. This is done by placing one colony on top of another, after the bees have quit flying for the night. If a sheet of newspaper is placed between the two colonies when uniting, the bees in the top hive will not fly out for two or three days, and will not return to their former stand.

Assuming that these double-deckers or two-story hives are on one side of a double switch-board, we will place upon the other side a clean hive containing a comb of healthy brood and a vigorous young Italian queen. Fill up with full sheets of foundation and throw the switch, thus diverting all flying bees over into No. 2, the clean hive, and the super. Next throw the switch on the back side to provide a new entrance for the young bees of the diseased colony. Ten days after making the first shift, repeat the operation by reversing the switch on the back side, again shifting the flying force of the diseased colony over into the healthy hive. At this shift, however, no new entrance is provided for the diseased colony; instead, a specially constructed bee-escape is pushed into the entrance back of the lever, which is pushed up tight against

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it. This is done at the second shift. As fast as the young hatching bees become old enough to try their wings, the exit of the bee-escape discharges them close to the main entrance of the healthy hive, into which they must go, since no bee can again enter the infected hive. When the brood has all hatched, and the young bees have been added to the healthy colony automatically, the combs are placed where no bee will get near them.

It will be seen that, when treating foul brood by this method, the bees leave the infected hive with empty sacs in search of nectar, and return to the healthy hive with a load of nectar fresh from nature's healing fountains. This is a modification of the Baldridge system, simplified by the new system of controlling bees with a minimum of labor. The process is so simple that, if foul brood were to break out in an apiary of ours, we would treat the whole apiary, regardless of whether individual colonies showed the disease or not. All that is necessary in order to rid an apiary of foul brood is to insert the bee-escape at the time of the second shift when practicing the new system of controlling swarming.

The same treatment will apply to black brood with equal force. A vigorous colony will be in condition to ward off disease successfully; therefore it is the part of wisdom to keep Italian bees, and see to it that all colonies are at all times supplied with wholesome food, kept in a normal condition. Nature will usually do the rest.

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WINTERING BEES.

GOOD STORES OF FOOD THE REAL SECRET OF SUCCESSFUL WINTERING.

We may talk about suitable protection, moisture, and ventilation, all of which are important factors in the successful wintering of bees; but the fact remains that the food question is the indicator that marks the turning-point of the future destiny of bees during long winter confinement. With food of a proper consistency bees will winter successfully under the most unfavorable conditions of temperature. All theories relating to moisture and ventilation are set at variance by the presence of abundance of good wholesome food. It has often been a source of conjecture among bee-keepers as to why an old box hive with open cracks admitting chilling drafts, snow, and sleet, will carry its colony through the winter in safety year after year. A closer scrutiny reveals the fact that the food within that hive is the accumulation of years, unmolested by the hand of man, rendered more wholesome by age.

A good cluster of bees under such a condition will usually winter successfully in defiance of all theories relating to moisture, ventilation, and protection. It is a noticeable fact that nine-tenths of the winter losses are due to starvation and dysentery. It is hardly necessary to add that winter losses can be reduced to a minimum by careful attention to the food question.

Since we cannot always be sure that the stores within our hive our suitable for a winter food, it is the part of wisdom to lessen the consumption of them. This is accomplished by affording suitable protection that will aid the bees in maintaining a normal temperature, and avoid disastrous results that might follow from an abnormal consumption of food.

OUTDOOR WINTERING.

Outdoor wintering of bees is practiced with varying results in many of the Northern States. There are three conditions that are essential to successful outdoor wintering of bees; namely, plenty of bees, plenty of honey, and suitable protection. No one should attempt to winter a colony out of doors that is light in either bees or stores. The winter cluster should

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be of sufficient size to enable the bees to maintain a normal temperature during severe weather without exhausting their vitality by an abnormal production of heat.

Colonies that are light in either bees or stores should be wintered in a good cellar or else united with some other colony in the fall and fed up to the required point for successful outdoor wintering. Twenty-five pounds of honey is considered sufficient to carry a colony through from November to May; however, 35 would, perhaps, be safer one year with another, as it is better to have a little left than to fall short and lose the colony in early spring. With a good strong cluster of bees, plenty of good wholesome food, and suitable protection for the sides, and especially for the top of the hive, bees will usually winter well south of latitude 42. North of that line it is, perhaps, better to winter in a good cellar, especially since there is a saving of 5 to 10 lb. of stores in favor of cellar wintering.

Expensive chaff hives are not necessary to successful outdoor wintering. Several thicknesses of burlap are laid upon a thin sealed cover, after completely covering the hive with several thicknesses of newspaper, that should come well down on the sides and ends. Over all a waterproof telescopic cap 12 inches deep is pushed down. Such packing will carry a colony through the winter as well as the most expensive chaff hive. In the absence of telescopic caps a very good way is to cut a strip of tarred felt paper as wide as the hive is tall, and wrap it around the hive after covering the hive with several thicknesses of newspaper as already mentioned. The felt should lap over five or six inches where the ends meet, and should be held in place by binder twine wrapped around the whole and tied. Next fold up a couple of burlap sacks of a size to cover the top of the hive without projecting over the sides. Over the whole, place a full-width sheet of tarred felt long enough to reach down to the bottom of the hive on both sides. Fold the edges over the ends of hive smoothly, letting the top fold over the sides, which are turned under. This will make the covering waterproof. However, we usually place the regular hive-cover on top. The entrances should be contracted to ⅜x6 inches with at least a one-inch space under the comb. Years of experience in the successful wintering of bees tells us that we need have little anxiety about colonies put up in this way.

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CELLAR WINTERING.

Cellar wintering is, perhaps, more difficult in some respects than outdoor wintering, because there are so many points to be taken into consideration. However, after years of experience in wintering bees both in cellars and on the summer stands I have come to regard a good cellar as a safe place in which to winter bees, especially for colonies that are a little light in bees or stores. Our strong colonies are packed for wintering on the summer stands as already described, and those that are not quite up to standard as regards the amount of stores and size of cluster are taken into the cellar. Since adopting this plan our winter losses have been reduced to a minimum.

There are four things that are conducive to best results in cellar wintering; namely, a temperature above freezing, and not above 50; total darkness, perfect quietude, and last, but not least, sufficient stores of good quality. These conditions are also modified by moisture and ventilation. While a few still cling to the theory that little or no ventilation is needed, most bee-keepers have come to believe that pure atmosphere is essential to the health of bees during their long winter confinement.

Recent developments would seem to indicate that a temperature ranging between 42 and 50 deg., with abundance of ventilation, is a safe proposition. If such a cellar is inclined to be damp, no harm will follow. However, it would be advisable to remove the covers and cover the tops of hives with pieces of old carpet or burlap sacks. Bees will also winter well in a dry well-ventilated cellar with a temperature of 35 to 40 deg. if the tops of hives are covered with thick cloths such as burlap sacks, old pieces of carpet, etc. From this point of view it would seem that there is no iron-clad rule that will apply to all cellars, regardless of temperature and moisture conditions. Thus, a low temperature accompanied by much moisture is considered a dangerous combination.

The amount of ventilation required will largely depend upon the number of colonies. If not more than 100 are kept, an open window will be sufficient. However, if several hundred colonies are wintered in a cellar a regular system of subearth ventilation will be required in order to control the temperature. Mr. R. F. Holtermann, of Brantford, Ont., has a model cellar of this kind in which he is able to maintain a uniform temperature and pure air with 500 colonies in one cellar.

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WHEN TO PUT BEES IN THE CELLAR AND WHEN TO REMOVE THEM.

The time to cellar bees is governed entirely by local weather conditions, and varies from Nov. 20 to Jan. 1. As a rule it is advisable to cellar bees before the real hard freezes begin, and before the hives are covered with snow. However, a little snow will do no harm, and is handy to plug up the entrance to keep the bees from flying out while carrying them in. I do not favor the practice of removing the bottom-boards since the bees are usually clustered upon it at this season; and in removing it the cluster will be considerably disturbed and many bees lost. For this reason we prefer a two-inch space under the frames open full depth in front, and the bottoms left on.

I use a hand barrow and carry two hives at a time, placing them in piles one above another, each pile being independent of any other. The bottom hive should be a foot above the cellar bottom.

For cellaring bees it is advisable to choose a cloudy day with the thermometer near the freezing-point. The bees should be handled carefully, avoiding sudden jars and undue disturbance, when they will soon quiet down after being placed. All that is required from this time until time to remove them in spring is to furnish sufficient ventilation to maintain a correct temperature, between 42 and 50 deg., with a pure atmosphere.

The time of soft-maple bloom is generally considered the right time to remove bees from the cellar. Begin in the afternoon of a cloudy day, with the thermometer near the freezing-point. Remove all the bees before you stop, even if it takes all night. In fact, a moonlight night is preferable to daylight. When a warm day comes, the bees will leave the hives without any excitement, and will mark the location of the hive, returning to their respective hives. There will be less drifting into other hives, and no robbing.

If, on the contrary, bees are removed from the cellar on a warm sunny day there will be a general stampede. They will rush from the hives without marking the location sufficiently, and will be likely to drift badly. If part of the bees were wintered out of doors the latter will be likely to take advantage of the situation and rob those just taken out.

It is advisable to leave the cellar-doors open the night before the bees are removed. By confining our labors to one pile

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of hives until all have been removed before disturbing another, the bees will usually remain quiet until all have been removed.

UNITING COLONIES.

The uniting of colonies is usually practiced in the fall when preparing for winter, or in spring when preparing for the harvest. It is very desirable to have a good-sized winter cluster to enable the bees to maintain a normal temperature during severe weather; therefore weak colonies should be united at the close of the season. The process is very simple. On a cool day when bees are not flying, bees may be successfully united by simply placing the weaker colony upon the other with as little disturbance as possible. In a few days the bees will have become acquainted, and the combs may be properly adjusted. If it is desirable to retain both queens, a queen-excluder is placed between the hives. No one should attempt to winter more than one queen in a hive, as a rule.

SPRING MANAGEMENT.

As soon as the bees have settled down to business after being removed from the cellar, each colony should be carefully inspected, and supplied with sufficient stores to last until fruit-bloom at least, after which the hives may be protected by wrapping them with tarred felt paper as described under outdoor wintering. However, in my location I do not find that the advantages gained by spring protection are sufficient to warrant the expense and labor, and my bees require little attention except to supply needed stores until fruit-bloom, when light colonies are united on the vacant side of the switch-board by placing one on top of the other with a queen-excluder between. These double deckers, each containing a good queen, will build up rapidly, and soon be in condition to begin work in the supers right at the beginning of harvest. This means a full crop of surplus honey unless the flowers fail to yield nectar. As a rule it is advisable to unite a light colony with a medium one rather than to unite two light ones.

LOCATION, AND ITS INFLUENCE UPON HONEY-PRODUCTION.

The principles introduced by this book can not be materially influenced by location, since they are based upon the

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instinct of bees that always remains the same. The methods of applying them, however, must be governed by location, time, and duration of the honey-flow.

It is clear that a location with no nectar-secreting flora would be a losing proposition under any system of management. On the other hand, by applying correct principles for the control of bees and attending to the most minute details, it is possible to produce paying crops of surplus honey under unfavorable conditions; but it is the part of wisdom to choose a good location first of all, and study it well. Learn the exact time and the probable duration of the blooming period of every nectar-secreting source within flying distance of your bees; and by bending every energy in an earnest effort to have them in the best possible condition, and by employing labor-saving methods, success is assured.

OVERSTOCKING.

This is a subject that has been discussed pro and con for more than a quarter of a century, and yet it is doubtful if the problem is nearer a correct solution than at the beginning. Owing to the fickle nature of the influences that govern the secretion of nectar it is a difficult matter to arrive at a definite conclusion as to the number of colonies that may be successfully kept in one place. A poor location may be overstocked with 25 colonies, while a good one might furnish ample pasturage for 200. This statement may be modified to suit different conditions in the same location; for example, a location overstocked by 25 colonies in a poor season might afford sufficient pasturage for 200 in a good season. From this point of view all our bees should not be in one place, but divided up into out-apiaries of perhaps 100 colonies.

IMPORTANCE OF GOOD STOCK.

Perhaps in no other branch of rural industry is the advantage of good stock more noticeable than in bee-keeping. Without entering into a lengthy discussion of the merits and demerits of the different races of bees that have been brought to this country with varying results, suffice it to say the Italians, as an all-around business bee, have few equals and no superiors. They are hardy, gentle, and industrious, not inclined to rob, yet good defenders of their home. They remain quietly upon the combs while being handled, and are

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easily held under control with very little smoke. Other races do good work storing honey when it is plentiful and near by; but it is when nectar is scarce and difficult to find that the superiority of the Italians is manifest. They possess a steady, quiet, determined perseverance that overcomes difficulties, and will often show a steady gain while other races are actually at the point of starvation.

The queens are prolific during the breeding season until the last drop of honey is gone; but during the honey-flow breeding slackens, and all hands seem to turn their attention to the gathering of nectar. This is one point of superiority possessed by the Italians over most other races.

Uniformity of marking is an indication of well-bred stock in bees as well as in other domestic animals. Three-banded Italians are more uniform in marking, as well as less irritable than the goldens, the latter being inclined to run about and take wing while the combs are being handled. This would seem to indicate that, in breeding for beauty, other qualities of a highly desirable character have been sacrificed, even to the intermingling with other less desirable races. Both the golden and the three-banded Italians are said to be, to a great extent, immune to black brood, which is a strong point in their favor if true.

HYBRIDS.

It is a mistake to suppose that hybrids, as a rule, are equal to pure Italians. While occasionally a hybrid colony may even outstrip pure Italians in gathering nectar when it is plentiful and near by, as a rule there will be a noticeable lacking in uniformity of results when compared with pure Italians. Hybrids are inveterate robbers and wicked stingers, and it will pay any one to Italianize his apiary, if only for the sake of having gentle bees to handle. Since Italians in their purity are superior to most other races, nothing is gained but much is lost by crossing them with any other race of bees.

It is true that, by judicious breeding, hybrids have been brought to a high state of perfection; but the bad temper is difficult to eradicate; and it is evident that much more could have been accomplished in a given time by beginning with pure-bred stock. The possibilities along the line of improvement of stock by careful selection and judicious breeding are great, and it is equally true that more can be accomplished in

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a few years by beginning with improved stock than in a life-time spent in trying to improve scrubs.

OUT-APIARIES.

The tendency of bee-keeping toward specialty necessitates the establishing of out-apiaries, since there is a limit to the number of colonies that can be profitably kept in one place. A reasonably good location should furnish sufficient pasture for 100 colonies. In highly favored locations, several times as many may be profitably kept in one place. The Alexanders, of Delanson, N. Y., have kept 700 colonies in one place, and secured an average of 75 lbs. of surplus per colony. If such locations were the rule instead of the exception, honey-production would indeed be a profitable occupation.

Having decided to establish an out-apiary, the most important points to be considered are, first, how far apart they shall be; second, what means of travel and transportation of supplies shall be employed; and, third, whether we shall produce comb or extracted honey. The distance between out-apiaries will doubtless be governed to a great extent by the ability to find suitable locations, but should not be less than four miles. The apiary should be reasonably accessible from the public highway, and far enough away from cultivated ground so that there will be no danger of the bees molesting teams and workmen in adjacent fields. An ideal location would be surrounded on the north and west by scattering timber, on ground gently sloping to the south and east, the entrances facing east and west, and at least 40 rods from any field that is likely to be cultivated or mown. I wish to emphasize this point, because experience has taught me that a mixture of bees and horses is not a desirable proposition, especially when engineered by the average farmer, who is, as a rule, in mortal fear of bees.

A farmer can hardly be blamed for regarding bees as a nuisance if he is obliged to have his horses clothed in pajamas, with an expert bee-keeper following them with a jumbo smoker in full blast in order to prevent a general mix-up of horses, farmer, and bees. Such a fracas might cost the bee-keeper more than the honey crop is worth. This is no creation of imagination, as I have known this condition to exist more than once.

If the bee-keeper lives in town, and does not wish to keep a team aside from the purpose of hauling supplies, it would,

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perhaps, be advisable to employ a teamster to do the hauling, and travel back and forth to out-apiaries by means of a motor cycle or an automobile. If the latter, light supplies as well as honey may be transported during the necessary visits. If he is situated so that he can establish a series of apiaries along a rural electric line, no other means of travel would be necessary, and the time spent upon the road would be reduced to a minimum.

Whether comb or extracted honey is produced in out-apiaries should be governed by the location and market conditions. If the location is a good one it is, as a rule, advisable to produce both comb and extracted honey. Such a policy would have a tendency to equalize the market between the two principal products of the apiary, and prevent overproduction of any one product that is likely to follow the production of only one.

Under modern methods out-apiaries may be run for comb-honey production, and the swarming impulse held under as perfect control as in the production of extracted, and with no more labor. If the harvest is uncertain and of short duration, as from basswood alone, it would be advisable to produce extracted honey exclusively. Some bee-keepers prefer to have a small building and an extractor at each apiary, as well as an underground cellar for wintering bees. Where one can secure a permanent location, such an arrangement has its advantages.

Others who keep a team of horses, and have good smooth roads to travel over, prefer to haul the honey home in the supers. These men usually have an extracting establishment equipped with power-propelled extractors, and all the modern conveniences for handling both comb and extracted honey from the hive to the market. Mr. Chalon Fowls, of Oberlin, Ohio, operates a series of out-apiaries on this plan, and produces an extra-fine quality of both comb and extracted honey, keeping his bees in permanently packed chaff hives that require little attention except during the busy season.

MIGRATORY BEE-KEEPING.

Since the honey-flow is largely governed by local weather conditions and rainfall, it is evident that there may be a wide difference between the extent of the honey-flow of locations only a few miles apart. A local shower coming at just the

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right time may be the means of causing a good honey-flow, while a location only a few miles away may be a total failure so far as nectar is concerned. In Canada and New York a few bee-keepers find it profitable to move their bees several miles to buckwheat regions. In some parts of Europe thousands of colonies of bees are annually transported to the heather fields. In California many bee-keepers move their bees, owing to scarcity of rainfall, from the mountain regions to the fertile valleys with their thousands of acres of alfalfa and blooming bean-fields. While, undoubtedly, the moving of bees a few miles in order to secure a crop of honey when otherwise the bees would have to be fed can be made profitable, yet as a rule it is, perhaps, advisable for the bee-keeper on a large scale to plant his guns and then stand by them—in other words, establish a series of out-apiaries covering a wide range of territory. If they are widely distributed there will always be a crop to harvest by some of them. There are those who still believe that a system of successful migratory bee-keeping can be conducted by running apiaries in the South for increase, and shipping the bees to the clover and basswood regions of the North. That such a system has not yet been operated successfully is no proof that it never will be if the right man gets back of it with the right system.

FEEDING AND FEEDERS.

It has been said that judicious feeding is the key to successful honey-production, and doubtless there is more wisdom conveyed by this simple statement than would appear at first sight. Many of the ills and dangers that lurk in the pathway of the unsuspecting bee-keeper may be quickly dispelled by judicious feeding. It is my candid opinion that if bee-keepers would see to it that their bees are at all times supplied with an abundance of food, foul brood and kindred brood diseases would soon cease to be the menace to bee-keeping that they now are. The intermittent periods of semi-starvation to which bees are too often subjected by neglect on the part of careless bee-keepers sap the vital forces of the brood and make them an easy prey to disease germs that are everywhere present, seeking for just such opportunities. It behooves every bee-keeper to keep his bees in condition to ward off disease successfully, by supplying them, during critical periods of a dearth of nectar, with an abundance of wholesome food. The

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danger period along this line varies with different locations. The few that are entirely exempt are highly favored.

The critical period in the North covers the interval between fruit and clover bloom, as this is the period of maximum brood-rearing, during which immense stores disappear as if by magic. Many colonies will be working in a hand-to-mouth way with but little in store for a rainy day. The situation is rendered more acute at this time by the liability of the weather to turn cold. When it does come on, there is trouble at once, since the bees, unable to leave the hives in search of nectar, are compelled to suck up the life-juices from the brood to sustain life within themselves. In spite of this, many colonies will perish outright, and many more will be so badly handicapped from loss of brood (at a time when every bee that hatches represents a unit in honey-production) as to render them practically unproductive.

The picture is not overdrawn, for this condition existed with greater or less severity throughout the Northern States in the spring of 1910. Money invested in sugar that is judiciously fed to bees during this period will yield manifold returns in honey-production, and may make all the difference between success and failure in bee-keeping. It is at this crisis that the plan of emergency feeding to be described in this chapter should be quickly resorted to as a first aid.

If any colony is discovered in such a condition that the bees are unable to move, they should be taken into a warm room and warm thin syrup sprinkled upon the top of the combs quite freely. In this way many colonies may be saved that would otherwise perish. The successful honey-producer of the future will have a feeder under each hive ready for instant use. When not in use for feeding it should be kept supplied with water in which a little salt is sprinkled. This will be relished by the bees, and will be conducive to health and vigor in their brood. Many times bee-keepers are deterred from feeding at a critical time, on account of the fussy job of hunting up and adjusting clumsy, inefficient feeders. Improved methods of bee-keeping call for improved feeders. This demand is fully met in the handy feeder shown in the illustration. It consists of a rim 2½ inches deep without top or bottom, of the same outside dimension as the hive that is to rest upon it. In the center of the rim lengthwise slides a pan or drawer 8 inches wide by 2 inches deep, with a ring on one end. To operate, draw out the pan 3 inches; pour in the feed and push it back

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into position under the hive. It is always in position, and is so arranged that bees can not drown in it, nor are they exposed when the pan is filled, and it is impossible for them to glue it fast. It may be carried into the cellar in lieu of the regular bottom-board; and if a colony is short of stores it can be fed in a warm cellar better than out of doors. At other times a little water in the feeder will prevent the bees from becoming uneasy during their long confinement in winter quarters.

The Handy Drawer Feeder, Showing It Drawn Out for Filling.

This feeder is adapted for use either at the top or bottom of the hive, as well as between the hive and super. However, as a rule it is desirable to feed from the bottom. When preparing bees for outdoor wintering we have a space under the frames 2½ inches deep. This is worth all the feeder costs, even for one winter, on account of the protection afforded to the winter cluster, because the pan covers the entrance, turning aside chilling blasts and shutting out rays of sunshine that often allure bees to destruction during bright days when snow is on the ground.

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It is surprising with what a lavish hand some bee-keepers provide food for all their domestic animals, and expect their bees to work for nothing and board themselves, and blame them if they fail to yield a handsome profit under such discouraging conditions. I well remember the time when I had a sort of misgiving about investing good money in sugar to feed bees, simply because I had not yet arrived at that condition that begets perfect confidence in an occupation—a condition that is essential to success in any business undertaking. Luckily those days are long since past, and I would as soon fail to feed my horses or poultry as my bees.

STIMULATIVE FEEDING.

It is the purpose of this work to eliminate unnecessary manipulation with bees; and since we regard so-called stimulative feeding as unnecessary, unprofitable, and unworthy of a place in the ranks of modern methods of economical honey-production, we have little use for it. It is very humiliating, after spending valuable time in stimulating feeding, to discover that such colonies are, as a rule, outstripped in the end by those that are supplied with an abundance of stores and left entirely undisturbed during the breeding season. With proper attention to the queen end of bee-keeping there is little gained by spring tinkering with bees, much less with spring stimulative feeding.

EMERGENCY FEEDING.

It frequently happens that the bee-keeper for some reason neglects to provide sufficient stores in the fall to carry his bees through to settled warm weather in the spring, and many are the times that I have discovered that my bees were at the point of starvation at a time when it was too cold to feed bees in the ordinary way. In such cases I fill a common wash-boiler with warm syrup, half and half warm water and granulated sugar. I then lay an empty comb on its side, letting it float upon the syrup in the tub. I next take a four-quart pail with sloping sides and perforated bottom, and dip it into the syrup, lifting it up quickly and holding it over the comb two feet or more, meantime moving it back and forth so as to cover all parts of the comb. When one side is filled I flop the comb over with the left hand and repeat the operation. In this way combs may be rapidly and perfectly filled. As fast as filled they are placed in a wash-boiler to drain, in which they are

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carried to the apiary and given to the bees as needed, always placing them close up to the brood-nest. After practicing this method for many years I still regard it as the best one for emergency feeding that has yet come to my notice.

OPEN-AIR FEEDING.

What I have said of stimulative feeding will apply with equal force to open-air feeding as usually practiced. The loss of vitality of the bees resulting from struggling, pulling, and hauling, to get at the feed, far outweighs any advantages that may be gained by outdoor feeding. If bees are known to be short of stores in mid-winter I have been successful in feeding them by the following plan: Take the colony into a warm room and place the hive upon a handy feeder, resting flat on the floor or other flat surface so that no bee can escape. Give them two quarts of feed and stir them up by thumping upon the hive. You will be surprised to see how quickly the feed will disappear. Repeat the operation until enough has been given to carry them through to settled warm weather. The syrup should be two parts granulated sugar and one part water, with 10 per cent of extracted honey added and fed warm. After feeding, the room is allowed to cool gradually, after which the bees may be packed on the summer stand, or carried into the cellar. Such a colony will often rank among the best in the apiary the following season. A very economical way of feeding colonies to prepare them for winter, or at other times when bees are out of stores, is to take a 12-lb. lard-pail with a perforated cover, fill it with sugar syrup or diluted honey, and invert it upon the tops of the frames, using an empty super to cover it. If the weather is cold, cover the pail and frames with a burlap quilt. From an economical point of view this method will be found very convenient.

FEEDING BACK.

Feeding back is a science that none but experienced bee-keepers should attempt; however, by employing correct methods partly filled sections may be finished at a profit. Feeding back to finish partly filled sections should begin immediately at the close of the harvest before comb-building has ceased.

Place a handy feeder upon a double-switch-board bottom beside a strong colony. Upon the feeder place a single division of a sectional hive (a shallow extracting-super will do as well) containing brood, some bees, and a prolific queen. Upon this,

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place two supers of partly filled sections; and after the bees have quit flying for the day, fill the feeder with honey that has been thinned down to the consistency of nectar.

The next day, about ten o'clock, throw the switch, shifting flying bees of the strong colony over into the contracted hive and supers. Feed two days and skip one, feeding about two quarts at a time, always after sunset. Unless the queen is able to keep the brood-chamber filled with brood, the feeding-back will not be a complete success; for that reason, only the most prolific queens should be used. Partly capped sections should be uncapped; otherwise the surface of the finished sections will be ridged and unsightly.

Remove finished honey by means of bee-escapes, so as not to disturb the bees, and keep feeding back as long as the bees do satisfactory work. Some colonies will not do much at finishing off sections over a feeder, and should be dropped and others tried. As a rule, while sections so finished will be well filled and firmly attached to the wood, the cappings are not so white as when finished during the honey-flow; nor is the quality of such honey fully equal to that stored in the natural way. For these reasons, and on account of the labor involved, it is advisable as a rule to avoid having too many partly filled sections at the close of the season rather than to undertake the fussy job of feeding back. This may be accomplished by placing empty supers at the top instead of at the bottom as the harvest wanes.

For some reason flowers do not yield nectar every day, and we have found it very profitable to feed on off days when running for comb honey so that no time shall be lost to the bees by intermittent cessations of the secretion of nectar. With feeders always in position this task is not arduous, and will be found very profitable.

SECTION HONEY.

In addition to what has already been said concerning comb-honey production and swarm control it is, perhaps, in order to say that comb honey is the recognized king of table sweets, as well as the most staple product of the apiary except wax. There will always be a large class of consumers who will not be satisfied with any thing less than section honey, regardless of cost. The bee-keeper who is wise enough to cater to the demands of this class of consumers can name his own price

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for his product, and find a ready market at his own door. For him the market problem has no terrors, simply because he is at the top of the ladder, where the largest apples are to be found.

It is always the common grades of honey that are the first to feel the effects of hard times and overproduction, either of which the comb-honey producer has little cause to fear. Methods of controlling bees described in these pages have swept the last obstruction from the pathway that leads to successful comb-honey production; and the bee-keeper who has been wise enough to turn a deaf ear to the oft-repeated exhortations of misguided promoters of a narrow specialization to "keep more bees" and produce extracted honey may now reap a rich reward.

SHIPPING COMB HONEY.

Section honey, while unquestionably the most fancy, is generally regarded as the most fragile commodity of the apiary, and therefore is more liable to injury during transportation. However, by exercising care in packing, and by carefully observing the recognized rules for shipping comb honey, there will seldom be any complaint regarding breakage.

When preparing section honey for market, the utmost care should be exercised in removing all traces of propolis from the wood, after which it should be carefully graded according to recognized rules for grading comb honey, each grade being packed in separate cases having corrugated paper in the bottom, and marked for just what it is. There are two points right here that will bear emphasizing. One is the importance of exercising judgment by the use of corrugated paper in the bottom and on top of every case in which honey is placed. Who would be so foolish as to send a case of eggs to market without cushioning the bottom? And yet that is just what hundreds of thoughtless bee-keepers are doing every day, and then they have the cheek to blame the freight-handlers for losses that are manifestly due to their own slipshod methods. It is a wonder, under existing circumstances, that freight-handlers do not lay an embargo on the shipment of comb honey.

HONEST GRADING.

No one can make a greater mistake than to attempt to palm off No. 1 for "fancy" honey. Such a practice can only

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result in disaster and loss to the packer whose private brand should be the guarantee of honest goods by an honest man who does not hesitate to stand back of that brand with a reputation for square dealing. Let the word go out that a certain brand is noted for crooked grading methods, and the fate of that brand of goods is sealed, and the packer will be compelled to seek a new market every year. On the other hand, let the word go out that a certain brand is a guarantee of honest goods and honest grading, and it will be sought for far and wide.

No. 1 and "fancy" grades should be encased in neat paper cartons tastily labelled, thus affording protection against the accumulation of dirt and dust, and to permit of handling the same as other food preparations without injury to the capping. Comb honey intended for shipment by freight (which is, as a rule, safer than by express) should be packed in crates or carriers holding from 100 to 200 lbs. with six inches of straw in the bottom well tramped down, and a false bottom on top of the straw, to provide a plain surface for the bottom of the cases to rest upon. The crate should be provided with convenient handles to prevent it from being dumped; also conspicuous caution labels, briefly describing the nature of the contents and emphasizing the necessity of careful handling. The shipping-cases themselves should be wrapped with paper before placing them in the crate, otherwise they will present an unsightly appearance from the accumulation of coal dust when they arrive at their destination. This detracts from their appearance as well as from their market value. The bee-keeper who will adhere strictly to the above rules will receive little complaint about breakage during transportation, and will find a rapidly increasing demand for his product at good prices. He who would command the highest price must be able to guarantee safe delivery by freight, as there are few buyers who will take the risk of careless packing. I have shipped tons of fancy comb honey to distant markets packed as above described, and have yet to receive the first complaint about breakage in transit.

BULK COMB HONEY.

The production of bulk comb honey has been of a gradual development and a healthy growth until it has developed into an industry of no little importance. While, undoubtedly, the

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conservative element will regard its advent as a sort of innovation that it is their duty to squelch in its infancy, progressive bee-keepers will recognize the advent of the product as one of the most important adjuncts to bee-keeping of modern times.

When viewed from the standpoint of economy of labor and simplicity of equipment (the two most important factors in the cost of honey-production), the production of bulk comb honey offers great inducements to the bee-keepers, especially to those who are so situated that they can deliver their product direct to their patrons. When we consider that bulk comb honey can be produced on a large or small scale with much less expense for both labor and equipment than either extracted or section honey we can better comprehend its possibilities. As yet this branch of bee-keeping is chiefly carried on by Southern bee-keepers. There is no reason, however, why Northern bee-keepers should not profit by the rich experience of their Southern brethren. Of course, no one should rush blindly into an industry of which he knows very little. On the other hand, concerning what I have had to say upon this subject, as well as upon every other subject upon which this book deals, go slow; prove all things, and hold fast to that which is good.

PACKAGES FOR BULK COMB HONEY.

For putting up bulk comb honey for market there is, perhaps, nothing better than the friction-top pails for a retail package, and the round jacketed five-gallon can, having a four-inch screw cap, for a wholesale package. From my limited experience, which has been confined to a home market, I do not favor the practice of mixing extracted with the bulk comb in the North, on account of the liability of the former to candy at the approach of cold weather; and nothing but strictly white, first-class honey should be offered in bulk. Off grades should be extracted and sold upon their merits. Extracted and bulk comb honey are two as distinctly separate products as are extracted and section honey; and a point that I wish to impress upon the minds of Northern bee-keepers is that it is a mistake to mix them promiscuously together in either case.

EXTRACTED HONEY AND BULK COMB HONEY.

On account of its economy of production, as well as the difficulty in the past to control swarming in the production of

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comb honey, many bee-keepers have turned their attention to the exclusive production of extracted honey. As might reasonably be expected, that branch of bee-keeping has not only assumed vast proportions, but rapid strides have been taken toward advancement and reform along the line of the production of this important product of the apiary. It is safe to assume that in no other branch of bee-keeping has there been such marked improvement as in the methods and appliances of extracted-honey production, nor does the improvement end with methods and appliances for the greatest improvement of all; and the one most needed has been the improvement in the quality of the product. Extracted, on account of the convenience of handling without breakage, as well as low freight rates, will appeal to the specialist. However, we should not lose sight of the fact that this class of honey comes into direct competition with cheap syrups that have a tendency to keep prices of this product from advancing in proportion to that of comb honey. Add to this the fact that three consumers out of five will prefer comb honey, it should not be a difficult matter to understand that the correct solution of the market problem will not be found in the exclusive production of any one of the three kinds of honey mentioned.

Undoubtedly the time is not far distant, however, when the exclusive production of bulk comb honey will claim the attention of a large majority of the bee-keepers of the country. This should be evident from the fact that it can be produced at considerably less expense for both labor and equipment than either comb or extracted honey. Moreover, bulk comb honey will bring from 2½ to 3 cents more per pound than extracted.

PRODUCING A FANCY ARTICLE OF EXTRACTED HONEY.

One of the chief causes that will, perhaps, always act as a leverage to keep down the price of extracted honey is the inclination of unwise bee-keepers to extract before the honey has become thoroughly ripened and capped. Honey that is extracted before it is sealed, or honey ripened in open vessels, loses its essential oils by evaporation, while honey that is thoroughly ripened in the hive, extracted, and sealed up in air-tight containers immediately after it is taken out of the combs, will retain that delicious aromatic flavor that adds a peculiar charm to comb honey, and which, when once lost, can not be restored by any amount of evaporation.

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In order to produce a really fancy article of extracted honey, it is necessary to have a sufficient stock of empty combs to hold the season's crop, and leave them on the hives until the close of the season before extracting. Such a practice, generally followed, would go further to boom the price of extracted honey than thousands of dollars spent in advertising thin unripe nectar.

EXPANSION AND CONTRACTION.

Expansion and contraction by means of shallow sectional hives is not without its peculiar advantages when practiced in connection with the new system—expansion up to the time of the honey-flow by giving the queen unlimited room for brood-rearing, and contraction at the beginning of the honey-flow by shifting the working force over into a single division of a sectional hive having full sheets of medium brood foundation in brood-frames, and full sheets of extra thin foundation in sections.

If an extracting-comb in which no brood has ever been hatched is placed on each side of the section-frames there will usually be no trouble from pollen in the sections. A second shift ten days after the first will re-enforce the swarm for a continuous honey-flow, and the extreme contraction of the brood-chamber will force practically all the honey into the sections.

The old queen is given to the swarm at the first shift, and the young bees in the parent hive are allowed to rear a queen. If no increase is desired, the single division of brood-chamber containing the swarm may be united with the parent colony at the close of the harvest. All that is required to do this is to place it on top of the old hive and throw the switch, shifting the returning bees over into the parent hive.

By this method swarming is held under perfect control; all the honey is stored in the sections, and every colony in the yard is requeened, and with very little manipulation. For comb-honey production and swarm control, in locations where the honey-flow comes from clover and basswood, followed by a fall flow, this method will give excellent results. If there is no fall flow it will be necessary to feed sugar syrup for winter stores which can be furnished for less than half the price of honey.

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If increase is desired, another division of a brood-chamber is given to the swarm after work in the sections has nicely begun. This will not materially interfere with work in the supers if placed at the bottom next to the bottom-board. By this method out-apiaries can be run for comb-honey production with the minimum of labor, and swarming held under perfect control with a visit once in eight to ten days. When uniting the swarm with the parent colony the old queen should, of course, be removed.

CONVENIENCES.

Convenience in manipulation involves the question of whether it is desirable to have our bottom-boards rest upon the ground or upon a stand five or six inches from the ground. There are some very good reasons why it would be well to have them a foot from the ground. First, one could manipulate them in a standing position, which is far preferable to sitting or kneeling. Second, they would be out of the reach of skunks, that do far more harm to bees than many suppose. Grass and weeds would be less likely to interfere with the entrances. On the whole we have about decided that, for our own use, our double-bottom-board equipment must be provided with legs ten or twelve inches long.

A box of smoker fuel and a box of matches, as well as a goodly supply of Dr. Miller's saltpetered rags, about complete the equipment of minor items. Of course, there should be bee-escapes on all windows, as well as a goodly number of Miller introducing-cages, wooden and wax cell cups, queen-cell protectors, etc. After having tried nearly all the different methods of lighting smokers we have come to regard Dr. Miller's saltpetered rags as about the best of all.

To prepare them, soak cotton rags in a solution of saltpeter and water, and hang them up to dry. When thoroughly dried, take a small rag, touch a lighted match to it, and drop it into the smoker, filling up with planer-shavings, rotten wood, chips, or whatever is most convenient, and the work is done. The rags will hang fire until the last scrap is consumed, during which time the fuel will have become ignited without extra effort in working the bellows. If the solution is too strong the rags will burn too rapidly. A little experience will determine the proper strength of the solution.

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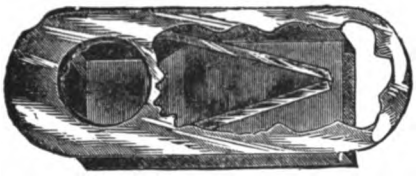
BEE-ESCAPES.

Bee-keeping is largely made up of small details, and our success in honey-production will, in a great measure, depend upon how well we attend to them. One of the minor items of apiarian equipment that help to make things run smoothly is the Porter spring bee-escape, without which no equipment is



Porter Bee-escape.

complete. The day is past when bee-keepers can afford to remove surplus honey a frame at a time, meantime subjecting the bees to harsh and cruel treatment and blinding them with smoke and crippling thousands of bees by roughly brushing them from the combs. Such methods are unscientific, laborious, and of a most promitive nature, not at all in keeping with modern economical methods. The bee-escape turns the instinct of bees to the account of the bee-keeper by ridding the supers of bees automatically, and is right in line with twentieth-century methods of controlling bees.

QUEEN-EXCLUDING HONEY-BOARDS.

Under the new system it will seldom be necessary to use Queen-excluders except for a few days after the first shift, and where contraction is practiced with sectional hives. As soon as work has nicely begun in the supers, and the brood-chamber has become established, they should be removed, except when producing extracted honey, when it is advisable, under the new system of controlling bees, to limit the queen to the brood-chamber.

Such an arrangement will insure a finer grade of honey, and will leave the colony in better condition at the close of the season. We want a brood-chamber for brood, and it is a source of annoyance to extract honey from combs that are partly filled with brood. Another objection to the scattering of brood promiscuously throughout the supers is that such supers can not be freed from bees by the use of bee-escapes, as they refuse to leave the brood. It is a mistake to suppose that

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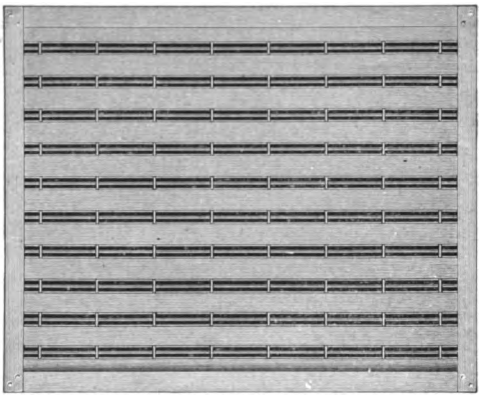
queen-excluders interfere with work in supers. If brood-chambers become clogged with honey where they are used, it is



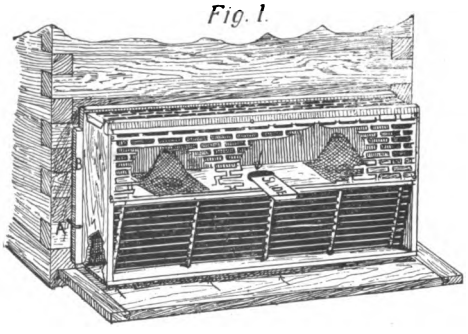
Wire Queen-excluding Honey-board.

owing to a poor queen, and not to the use of queen-excluders. The wire excluders are preferable because of the greater ease with which the bees can pass through them.

DRONE TRAP.

Drone-traps are very convenient as well as useful in ridding the apiary of undesirable drones that so often appear in

Fig. 1.



Alley Drone-trap.

spite of the vigilance of the bee-keeper. They are also useful in preventing the absconding of swarms in the absence of the bee-keeper. I would always recommend them in preference to clipping the queen's wing, which is an unnatural proceeding that often results in the loss of a good queen, and invariably, in the drifting and mixing of bees at swarming time, where swarm-

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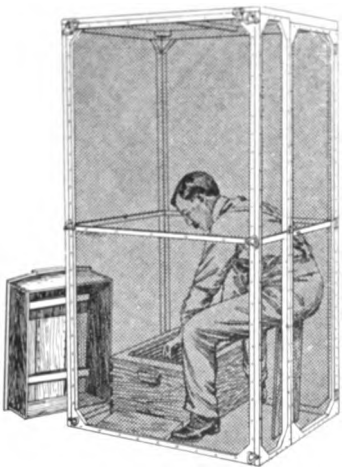
ing is allowed. Under the new system the use of drone-traps is limited to the legitimate purpose of trapping undesirable drones.

BEE-TENTS.

Since the bee-keeper (and especially the queen-breeder) is often compelled to work with his bees during a dearth of nectar when robber bees are prying around hunting for an opportunity to appropriate the sweets of exposed hives, a little carelessness at such times will soon cause a serious disturbance in the apiary that would most effectually put a stop to further



Wire Cage for Working Hives when Robbers are Bad.

manipulations with bees for that day, and perhaps cause no little inconvenience for several days afterward; for, let a robber once get a taste of stolen sweets from a certain hive, and it will continue to prowl around that hive for several days after, endeavoring by every means within its power to outwit the guards and gain an entrance. At such times it is very convenient to have a tent large enough to cover a hive and the operator. It should be six feet high, and covered with wire cloth or mosquito netting, except the top, which is left open. The operator stays inside and carries it about from one hive to another, setting it over the hive to be manipulated. When the manipulation is over, and the tent removed, every thing is in a normal condition and the robbers are outwitted. During these intermittent periods of a dearth of nectar it is advisable to use as little smoke as possible, and avoid undue

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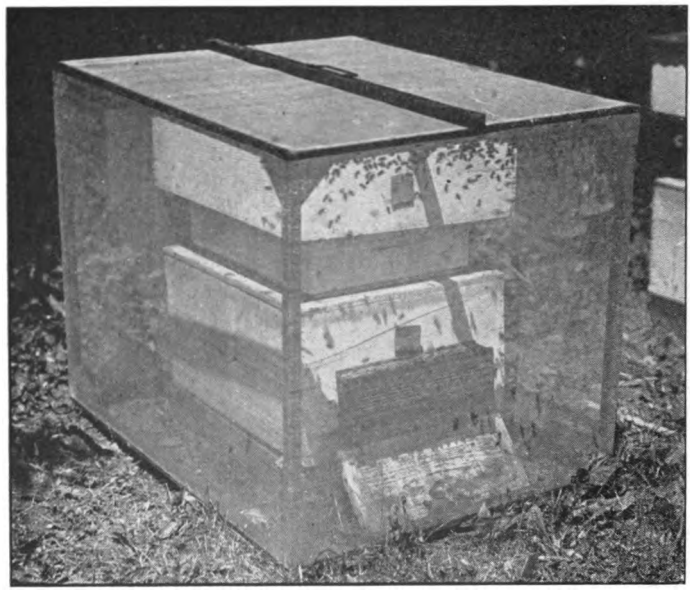
excitement of the bees, which has a tendency to throw them off their guard and give the robbers an advantage of which they are are ever on the alert to avail themselves.

It is also very convenient to have one or two small cages just large enough to set over a hive. These are covered over the top as well as the sides with wire screen, and are handy



A Handy Cage for Circumventing Robbing.

to set over a hive that has been manipulated for a few minutes until the bees have regained their composure sufficiently to protect the entrance.

ROBBER-TRAPS.

As a rule, robbing is begun by a single bee, which is followed by others of the same hive until the whole colony is engaged in a free-for-all fight to gain access to the pillage hive. If taken at the beginning, quiet may be quickly restored by removing the colony that is being robbed and placing on its stand a robber-trap. In a few minutes all the robbers will be jailed, and quiet is again restored. The trap is simply a hive-body with the entrance closed, and a ¾-inch hole bored just above it. Over the hole, on the inside of the hive is tacked

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a conical bee-escape projecting inward two or three inches. The hole at the apex of the cone should be about the size of a common leadpencil. In five minutes every robber will have been caged, and should be speedily executed as the surest means of restoring peace and tranquillity in the apiary.

If two colonies are on a double switch-board, and one is being robbed, all that is necessary in order to give the robbers the surprise of their lives is to throw the switch, shutting off outward communication with the colony that is being robbed, and opening communication with the rousing colony by its side. The robbers will meet with a hot reception, and get their just dues in short order. In 24 hours the switch may be reversed, and all will be quiet and serene, for the robbers will either have been killed outright or so badly punished that they will give that entrance a wide berth in the future.

THE HAND SWITCH-LEVER DOUBLE-BOTTOM BOARD; WHERE TO GET IT.

Doubtless many will attempt to manufacture the equipment for their own use from the description given in this book, and some will, perhaps, condemn the system when the fault is in the improper construction of the equipment. For this and other reasons the inventor has thought it best to protect it by letters patent, and offer the equipment for distribution through his regular authorized agents. All inquiries relating to the equipment should be addressed to The A. I. Root Co., Medina, Ohio.

No one should attempt to manufacture the equipment, even for his own use, without a license from the inventor, accompanied with a sample board complete as a working model, as there are some points not clearly shown in the engravings. As a rule it will doubtless be cheaper for bee-keepers to buy the equipment from a supply-house equipped with modern machinery for the turning-out of accurate work; yet we do not wish to deprive those who are remote from shipping-points of the privilege of making the equipment for themselves. Individual rights will be granted at a nominal price, licensing the purchaser to manufacture the equipment for his own use, but not for sale. Applications for individual rights must be addressed to J. E. Hand, Birmingham, Ohio.

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